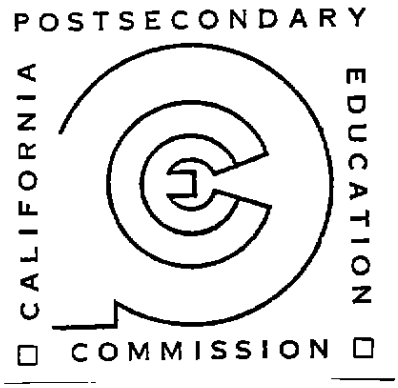
OFFICE AUTOMATION EVALUATION

A Staff Report on the Effects of Using Xerox Office Automation Equipment During a Three-Month Trial Period



CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

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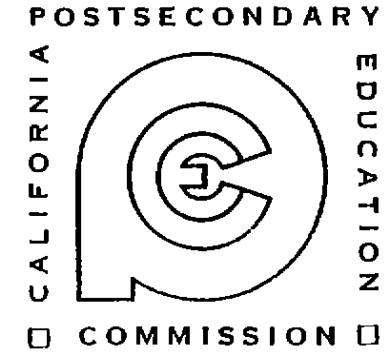

CALIFORNIA POSTSECONDARY EDUCATION COMMISSION
1020 Twelfth Street, Sacramento, California 95814

Commission Report 84-9

February 1984

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INTRODUCTION

PURPOSE AND ORGANIZATION OF THE COMMISSION

The California Postsecondary Education Commission was established by the Governor and the Legislature to provide policy analyses, advice, and recommendations on statewide policy and funding regarding colleges, universities, and other postsecondary institutions. In carrying out its mandates, the Commission:

1. Develops reports and studies that: (1) describe various aspects of California's postsecondary educational enterprise; (2) document their history, present status, and expected future condition; and (3) prepare recommendations for future state educational policy;

2. Maintains a state-level information base for California postsecondary education;

3. Develops, and periodically updates, a state-level plan for postsecondary education;

4. Participates in the appropriate stages of the legislative and executive budget processes with respect to institutional and systemwide budget requests;

5. Advises the Governor and the Legislature on the need for, and location of, new institutions and campuses;

6. Reviews segmental requests for new academic and vocational programs;

7. Reviews all proposals for admission standards proposed by the public segments and makes appropriate recommendations to the legislative and executive branches;

8. Reports annually to the Legislature and the Governor on the financial condition of California's independent colleges and universities; and

9. Prepares and publishes a Health Services Education Plan in concert with the Health Manpower Plan prepared by the State Department of Health.

The Commission is composed of 15 members. Nine members are appointed as representatives of the general public: three by the Governor, three by the Speaker of the Assembly, and three by the Senate Rules Committee. Three State boards -- the California Community Colleges' Board of Governors, the California State University's Board of Trustees, and the University of California's Board of Regents -- each appoint one of their members to serve on the Commission. The Governor appoints one representative from the independent colleges and universities from a list submitted by the association of these institutions. The chairpersons of the Council for Private Postsecondary Educational Institutions and the State Board of Education each appoint one of their members to serve on the Commission.

The Commission meets approximately nine times a year to discuss and adopt the research reports and studies prepared by the staff. The agenda varies in size and complexity, though the average agenda contains 12 major studies.

The Commission staff is headed by a director, who is appointed by the Commission. The staff is composed of 20 research, 11 support, 5 data processing, and 12 administrative and technical personnel. The product of staff work is primarily research reports that develop policy recommendations from information collected in the data base. These reports are often written by one staff member but may have multiple authors. They are reviewed by technical advisory committees composed of people from the education community, a staff review group, the executive staff, and the Commission's editor. After each review step, new drafts may be prepared; thus up to six drafts may be produced for each report.

The first draft of the report is typically written by the research staff member either by handwriting, typing on a standard typewriter, or using one of the word processors. If the draft is handwritten or typed on a standard typewriter, then one of the support staff must retype the document on a word processing machine If the draft is originally typed by the researcher on a word processor, the support staff is responsible for correcting, formatting, and updating the subsequent drafts.

The Commission presently owns the following equipment. four IBM Office System 6s, four IBM Mag Card IIs, one IBM 6640 Document Printer, one Tektronix Graphic Plotter, one Xerox 9400 Printer, and Four Phase System Model IV - 65 computer with ten terminals.

WORK OF THE OFFICE AUTOMATION STAFF COMMITTEE

In the spring of 1983, the Commission appointed a staff committee to review its short-term and long-term needs for word processing, data processing, and research studies production. The four initial objectives identified by the committee were to:

1. increase the amount of research time available to the professional staff,

2. improve the access and integration of quantitative data with research studies;

3. decrease the time and effort currently required by the professional staff to produce CPEC documents for external distribution; and

4. decrease the professional's staff dependence on the support personnel.

The committee conducted a survey of the staff to explore the needs for telephone answering, word processing, graphics, production, data processing, and duplicating. The survey clearly identified a need and a desire to update the existing equipment, provide access to work stations for all staff, and improve merging of data with text writing.

After the Committee had identified the need for updating the word processing equipment and expanding the configuration to a local area network, it established additional objectives:

5. Facilitate the preparation of reports by multiple authors;

6. Integrate multiple functions within one workstation (word processing, data processing, and graphics);

7. Reduce paper flow in the office;

8. Implement streamlined document creation process; and

9. Improve quality of final work products.

The committee explored the technology that was available and investigated what configuration of equipment would meet the stated objectives and the staff's identified needs. One of the vendors, Xerox Corporation, offered to provide an office automation network for the Commission during a three-month period at no cost. Prior to the trial period, a survey was conducted to document the current workflow.

EQUIPMENT USED DURING THE TRIAL PERIOD

The office automation network that was installed at the Commission office included:

- Eight Xerox 8010 Professional Workstations ("Stars"). These units are recommended for professional staff members whose work product includes text and graphics and who may also need to access existing computerized data bases. The Star is capable of handling the customary word-processing function (input, recall, editing, and output) without the skilled keyboard commands normally associated with word-processing equipment It also provides in-line graphics, diagrams, bars, and other non-text capabilities. The system permits authors to assemble new text by merging selective portions of one or more previously written pieces and prepare copy for electronic typesetting in a variety of fonts, sizes, and page configurations.

- Four Xerox 860 Word Processors. These units are designed for heavy-duty text editing and text requirements. They can easily create proper formatting for such things as line numbering, table of contents, footnotes, and outlines. Software is available to communicate as a teletype, an IBM 3270 computer, and other equipment on the network.

- Four Xerox 820-II Personal Computers. These computers are intended for use as computational devices to support key entry, local processing, and communications. Those provided in the trial period were equipped with floppy disketts, fixed disc storage units, individual printers, and word processing software. They also came equipped with BASIC programming language to provide for local data processing.

- One Xerox 42 MB File Server. This File Server acts as a central filing resource for the entire system. It provides approximately 11,000 pages of storage and houses the Electronic Mail service for the network.

- One Xerox Print Server. The Print Server provides network users with laser image-generated printed originals at speeds of up to 12 pages per minute. The Print Server prints business letters, lengthy reports, equations and graphic illustrations, with dozens of type styles, fonts, and sizes to choose from

- Ethernet Cable. This coaxial cable connects all the units on the network.

The equipment was located as follows:

- Three of the Stars were located in open areas and were available for use by all staff. The other five Stars were assigned to individual staff members, including the two members of the editing staff who used them for reviewing, editing, correcting, formatting, and publishing Commission reports and studies. The other three were assigned to research staff members for use in developing reports.

- The four word processors were assigned to support staff involved in either agenda production or high volume, repetitive work assignments.

- Two of the personal computers were assigned to the data-processing staff to determine the feasibility of converting the Commission's data bases to a network with personal computers. During the trial period, these two computers were not connected to the local area network. The third of the personal computers was located in an open area and was available for use by all staff, and the fourth was assigned to a research staff member who planned to employ large quantities of statistical/computational data in his studies

The installation of the equipment was started in mid-September, though training for use on the word-processing and professional workstations began the last week of August and continued in Xerox's Downtown Plaza office until the equipment was installed. The training concentrated on the staff who would be assigned a station on a full-time basis. An average of three full days training was provided for the "major users" of the network prior to the installation. Once the network was installed, other interested staff members received training on the in-house equipment through a self-paced instructional program. The first month of the trial period was devoted primarily to training and getting acquainted with the network.

RESULTS OF THE EVALUATION

An evaluation of the effectiveness of the Xerox equipment in meeting the Commission's needs was completed at the end of the three-month trial period. It consisted of reviewing the work products and interviewing staff who used the Xerox equipment. (A list of the staff interviewed appears in Appendix A.) During the interviews, staff members compared the steps they needed to complete projects with the IBM existing stand-alone equipment versus the Xerox network.

They also offered their perceptions about their workload and productivity under both systems. (No quantifiable method exists to measure research-staff productivity, since no reliable tests exist for measuring the complexity, significance, or scope of their reports.)

WORK PRODUCTS COMPLETED

Budget Change Proposals

Even though the first month of the trial period was supposed to be devoted to training, several unanticipated lengthy documents were produced on the network that had to be accommodated on a rush basis. In particular, during the latter part of October the Commission was asked to comment within two weeks on the Budget Change Proposals (BCPs) submitted to the Department of Finance by the University of California, the California State University, the California Community Colleges, and the Student Aid Commission. Over 50 BCPs were received for review, and comments were prepared on 35 of them, including the following

- UNIVERSITY OF CALIFORNIA

  Graduate Enrollment Workload Increase
  Teaching Assistants
  Instructional Equipment Replacements
  New Equipment for Engineering and Computer Sciences and Related Fields
  Instructional Use of Computers
  Student Affirmative Action; EOP Financial Aid
  Graduate and Professional Student Affirmative Action; Faculty Affirmative Action

- CALIFORNIA STATE UNIVERSITY

  Educational Opportunity Program
  Reduction of State University Grants
  Student Affirmative Action: Data Management Systems
  Instructional Equipment Replacement
  Special Repairs
  State University Fee Reduction

Instructional Equipment Replacement (Program Change Proposal)
Learning Assistance Programs
Interactive Television - Stockton Center
Joint Doctoral Program
English Skills for Permanent Resident/Refugee Students
Computer Aided Productivity Laboratory
Student Writing Skills
Academic Program Improvements
Computer Science and Engineering Enhancements
Faculty Development, Recruitment and Retention
In-Service Training for Public School Personnel

- CALIFORNIA COMMUNITY COLLEGES

Inflation Adjustments and Growth in ADA
Differential Funding Study
COLA and Growth Adjustments - Extended Opportunity Programs
COLA and Growth Adjustments - HSPS (Developmentally Disabled)
COLA and Growth Adjustments - HSPS

- CALIFORNIA STUDENT AID COMMISSION

Award Adjustments - Cal Grant A
Award Adjustments - Cal Grant B
Award Adjustments - Cal Grant C
Award Adjustments - Graduate Fellowship
Award Adjustments - Bilingual
Cal SOAP Adjustment

The BCPs were distributed to ten staff members for written comment. During the two-week period, these staff had to read the BCPs, provide the related history, identify the issues, develop informational questions, and prepare responses using the Xerox network. Staff members who had some working knowledge of the network prepared their comments on the professional workstations. Other staff handwrote their comments, and the support staff typed them on the Xerox equipment. The time required for normal preparation, review, and editing of the BCP comments was reduced by approximately 20 percent because of the network. The support staff worked four hours overtime to assist in producing the comments. This overtime was required to assist with the formatting of the documents. If the training had been completed or procedures had been established, the overtime probably would not have been required. The frustrations that rose during the production were related to the abbreviated training period, unfamiliarity with the equipment, and undeveloped procedures. Attachment A is a copy of the BCP comments.

Legislative Testimony

Another example of work that was accomplished during the first month of the trial period was the preparation by several staff members of legislative testimony on Community College finance. The Xerox network permitted last-minute insertions of text in response to additional legislative questions. The staff member responsible for assembling the testimony estimated that normally the preparation would have required seven and one-half days of

staff time, but the network allowed it to be completed in five and one-half days -- a savings of 27 percent. Attachment B contains a copy of the testimony.

Commission Agenda Packet

Prior to the trial period, the December Commission agenda packet had been identified as one of the primary documents that would indicate the level of need for automation above the existing IBM stand-alone word-processing equipment. Tables 1 and 2 below compare the scope of the March 1983, September 1983, December 1983, and January 1984 agendas and the number of Commission staff employed at those times. The number of reports reflects those that were created and appeared for the first time in each agenda packet (Appendix B lists the reports in each packet). In addition to these reports, packets also include minutes of previous meetings, updates of reports, copies of previously presented informational reports that require action by the Commission, and prospectuses of new reports. Each packet contains approximately 500 pages, and 170 copies are distributed.

Table 2, for example, reflects that in comparison to the March agenda, the December agenda had 14.3 percent more reports, the administrative and technical staff was reduced by 5.6 percent, the support staff was reduced by 9.1 percent, the research staff was reduced by 19.4 percent, the total staff was reduced by 12.0 percent, and the overtime for the support staff was reduced by 81.7 percent.

TABLE 1 Comparison of Commission Agenda Reports, Commission Staff, and Overtime, March 1983 - January 1984

	March 1983	September 1983	December 1983	January 1984
Number of Reports Appearing for the First Time	7	8	8	5
Number of Administrative and Technical Staff	18	18	17	17
Number of Support Staff	11	11	10	11
Number of Research Staff	21	18	17	17
Number of Total Staff	50	47	44	45
Number of Agenda Overtime Hours for Support Staff	52.0	57.0	9.5	44.5

TABLE 2 Percent Change Between December 1983 and Other Periods on Items Listed in Table 1

	March 1983	September 1983	December 1983	January 1984
Number of Reports Appearing for the First Time	-14.3	0	--	-60.0
Number of Administrative and Technical Staff	- 5.6	- 5.6	--	0
Number of Support Staff	- 9.1	- 9.1	--	- 9 1
Number of Research Staff	-19.4	- 5.6	--	0
Number of Total Staff	-12 0	- 6.4	--	- 2.2
Number of Overtime Hours for Support Staff	-81.7	-83.3	--	-78.7

The December agenda was printed on the Xerox network and, with the formatting, font selection, and graph and table capabilities, the reports were printed on one-third less paper than would have been used with the prior equipment configuration. This resulted in savings for printing, paper, and postage. Attachment C is a copy of the September 1983 agenda (prepared on the IBM stand-alone equipment) and Attachment D is a copy of the December 1983 agenda (prepared on the Xerox office automation equipment).

It was the opinion of all research staff, support staff, the editor, and the Director that the December agenda was of higher quality than previous agendas, primarily because the network permitted more time for staff review and editing of all the studies, smoother coordination of work on joint projects, and enhanced the formatting capabilities. If Xerox equipment had not been installed, there is no doubt that considerable overtime of the support staff would have been required and some of the items would have been held over to another agenda. The editor estimated that overtime required would have equaled six staff days on the weekend plus additional work in the evenings, adding up to an additional 66 overtime hours, if the IBM stand-alone equipment had been used for the production of the agenda.

PERCEPTIONS OF STAFF

Research Staff

The research staff interviewed varied from those who were casual users to those who were "heavy duty" users. The staff who had full-time usage of the machines became much more adept with the features of the Star. One of the researchers who had permanent assignment of a Star was able to utilize it to organize his notes and assist with literature searches, which enhanced his research and permitted more time for writing his reports.

The feature that the researchers were most enthusiastic about and recommended to be included in any system purchased were:

- the ability for multiple authors of a document to create and transmit information back and forth,
- the ability to view simultaneously open two - four documents on the screen and transfer information between documents,
- the ease of editing and moving material within the document,
- the ability to create graphs and charts with less effort than on the Tektronix Graphic Plotter and with better clarity,
- the ability to merge text and graphs without "cutting and pasting."

All researchers who used the equipment said their productivity increased because of the Xerox network, and from a minimum increase of 20 percent up to a maximum of 40 percent. They indicated that the normal turnaround time for documents to be typed in the word-processing center was eliminated completely. Prior to the trial period, they had experienced between two- and six-week delays in non-agenda documents typed by the center.

The time required to create graphs was drastically reduced. For example, one staff member indicated he had prepared an extensive set of graphs on the Tektronix which took two weeks to complete He was able to complete a similar set of charts on the Star in two days. Another staff member had prepared a set of charts on the Star which each took 15 minutes to complete. After the network was removed, he had to prepare similar charts on the Tektronix which took up to three hours each to complete.

Interviews were not held with the research staff who did not use the Xerox equipment, although in general staff meetings they raised concerns about the access to the Stars in the open area. Some staff felt intimidated when training on the equipment, especially if other staff members were waiting to use the machines. Others expressed problems with using the machines in the open area when all their materials were in their office. It was not conducive in all situations to work in the open area.

Support Staff

Even though the word-processing center was disbanded in September 1983, the technicians who were assigned to the center were still responsible for production typing. During the trial period, one of the support staff went on maternity leave for three months. She was not replaced and her workload was absorbed by existing staff.

During the interviews, it was obvious that support staff work assignments had changed during the trial period. The technicians undertook minimal typing for the December agenda and other long documents produced during this period, since most authors prepared their materials directly. Their required overtime was significantly reduced at a time when support staff was reduced by 9 percent.

It was also apparent during the trial period and in the evaluation interview that the 860 word processors were not compatible with the work assignments of the support staff. Every researcher and support staff member indicated in the interviews that difficulties developed in formatting documents that were transmitted from the 860s to the Stars. Thus the Committee concluded that the 860 would not be appropriate for the work assignments of the Commission.

There were some fears expressed throughout the trial period and interviews that an office automation network would result in the elimination of support positions; but overall, there was positive acceptance of the network and the opportunities that were available for all staff members to participate in producing higher quality products.

Data-Processing Staff

Two of the 820-IIs were assigned to the data-processing unit to test the compatibility of personal computers with the Commission's information needs. The trial was able to test some of the features of the network and the capabilities of the personal computers but some critical areas could not be tested because (1) the co-processing capabilities of the 16/8 were not available during the trial period; (2) the COBOL compiler was not available for testing; and (3) the 820-IIs in the data-processing unit were not connected to the network

Based on the limited trial, the data-processing staff has concluded that:

- The personal computer would provide an added dimension for the research staff in that data, graphics, and spreadsheets could be prepared by the data-processing staff for inclusion in research studies.
- Information could be routed from the Four Phase computer to the 820-II through the Teale Data Center.
- It was easier to communicate with the Teale Data Center with the Four Phase computer than the 820-II

- The personal computers are not recommended for stand-alone data processing. They need to be tied into a network and/or the Four Phase computer so that data bases can be shared.

- The 820-II is limited in that it can only perform one function at a time. For example, if it were communicating with Teale, the staff could not be editing other material on that workstation. It appears, however, that the 16/8 would provide dual functions performing at the same time.

- The limited printing speed of the 820-II will not meet the needs of the data-processing staff

- If the network with 820-IIs or 16/8s were installed without retaining the Four Phase computer, the conversion of existing COBOL would be extensive requiring approximately six months' work of the data-processing staff.

CONCLUSIONS

Clearly, the Commission's productivity increased during the trial period. This increase occurred at a time when the staff had been reduced because of resignations, early retirements, and maternity leave. Normally, it would have been expected that productivity would decrease under these circumstances, but the Commission was able to meet all of its legislative mandates in a timely fashion. The productivity increase can be attributed both to the office automation network and the commitment of the staff to utilize its resources.

Based on both the work products and the staff interviews, the following conclusions are warranted:

- The research staff would have a minimum productivity increase of 20 percent. During the trial period, the research staff was reduced by 19 percent. All research members interviewed stated that their personal productivity had increased from a minimum of 20 percent to a maximum of 40 percent.

- The administrative staff would have a minimum productivity increase of 5 percent. The administrative staff who used the equipment indicated an increase in either their productivity or the quality of their work. It is assumed that a minimum impact in productivity would occur.

- The support staff would have a minimum productivity increase of 10 percent. Presently, the support staff is assigned word-processing equipment, and therefore, the addition of new equipment would have minimal impact on its productivity. Despite the fact that the support staff was reduced by 9 percent during the trial period, by using the network they were able to meet all their workload requirements without replacing the staff member on maternity leave.

Prior to the installation of the network, the staff completed a work-flow survey that identified the percentage of staff time spent on various activities. The survey data were applied to the measures on office automation and

productivity developed by Booz-Allen and Hamilton, which are the only available source of information on these topics, and these results predicted a potential time saving of 19.27 percent for the research staff and 26.47 percent for the support staff. While some might question the validity of the Booz-Allen and Hamilton approach, the evaluation of the Commission's trial period for the research staff is consistent with its projections. The support staff projections differ, possibly because these staff already had access to word-processing equipment.

If a complete office-automation network were installed (not necessarily with every staff member assigned a workstation but with every staff member having access to a workstation), the Commission's overall productivity would increase as indicated in Table 3, which projects the minimum cost savings related to the increased productivity for administrative, research, and support staff, based on this year's annual salary and benefits cost.

TABLE 3 Projected Increase in Productivity

Employee Category	Total Approved Positions	Cost Per Employee	Minimum Time Savings Per Employee	Minimum Value of Savings
Administrative	12	44,489	5%	$ 26,693
Research	20	50,791	20%	$203,164
Support	11	20,549	10%	$ 22,604
Total Annual Savings				$252,461

If an office-automation network were approved for purchase and if Xerox were awarded the bid, it is recommended that the configuration of equipment differ from the trial period and that further tests be completed on the use of the 16/8 personal computer with a COBOL compiler before the final configuration is determined. In particular, the Stars are recommended for use by the research, editing, and some administrative staff, and by two production typists, while a word processor or electronic typewriter that is connected to the network is recommended for the remaining support staff.

APPENDIX A

Staff Members Interviewed on the Use of the Xerox Network

January 4

Teresa Smanio, Legislative Unit (assigned a 860 word processor)

January 6

Bruce Hamlett, Research Staff (assigned a 8010 Star)
Donnel Jenkins, Analytic Studies (assigned a 860 word processor)
Jeanne Ludwig, Research Staff (used a 8010 Star)
Gladys Stangl, Academic Affairs (assigned a 860 word processor)
Greg Gollihur, Research Staff (used a 8010 Star)
Donna Stephan, Quality Control (assigned a 8010 Star)

January 9

Marj Dickinson, Research Staff (used a 8010 Star)
Sam Kipp, Research Staff (assigned a 8010 Star)
Bill Storey, Research Staff (assigned a 8010 Star)
Peggy Jennings, Systems Administrator
Bill Hamre, Research Staff (used a 8010 Star)
Kim Milardovich, Executive Unit (assigned a 860 Word Processor)
Murray Haberman, Research Staff (used a 8010 Star)
Mark Irish, Data Processing Supervisor (assigned a 820-II Personal Computer)

January 10

John Harrison, Associate Director, Analytic Studies (used a 8010 Star)
JB Hefferlin, Editor (assigned a 8010 Star)
Pat Callan, Director

APPENDIX B

New Reports Included in Commission Agenda Packets, March 1983 - January 1984

MARCH 1983 AGENDA

1. Student Charges, Student Financial Aid, and Access to Postsecondary Education: Options for the California Community Colleges
2. Services for Students With Disabilities in California Public Higher Education
3. Update of Community College Transfer Student Statistics, Fall 1982
4. Major Gains and Losses: Recent Shifts in Popularity of Academic Disciplines as Fields of Concentration
5. Annual Summary of Program Review Activities, 1981-82
6. Recruitment and Retention of Engineering
7. The Commission's Principles for Community College Finance

SEPTEMBER 1983 AGENDA

1. California's Participation in Guaranteed Student Loan Programs (First Part)
2. Status of Telecommunications Issues in Education
3. Update on Private Postsecondary Institution Authorization
4. Second Progress Report on the 1983 High School Eligibility Study
5. Report on Developments Affecting Teacher Education
6. California College-Going Rates, 1982 Update
7. Improving College Preparatory Programs Through High School Accreditation
8. Public Policy and Accreditation in California (Part One)

DECEMBER 1983 AGENDA

1. Evaluation of Community College Student Affirmative Action Transition Projects
2. California College-Going Rates, 1982 Update
3. Report on the California Mathematics Project
4. Preliminary Report on Faculty Salaries, 1984-85
5. A Prospectus for California Postsecondary Education: 1985-2000
6. California's Participation in Guaranteed Student Loan Programs
7. The Wealth of Knowledge: Higher Education's Impact on California's Economy
8. Access to Student-Specific Data

JANUARY 1984 AGENDA

1. Preliminary Report on the High School Curriculum Survey of the 1983 Eligibility Study
2. Faculty Collective Bargaining in the California State University
3. Public Policy and Accreditation in California (Part Two)
4. Meeting the Costs of Attending College
5. A Prospectus for California Postsecondary Education: 1985-2000